

Claims

[1] A magnetic resonance imaging method comprising:

- (1) a step for applying one or more pulses of the gradient magnetic field sequentially;
- (2) a step for calculating the residual magnetic field being generated in the magnetic device by the gradient magnetic field on the basis of the residual magnetic field response function that represents the relation between the strength of the applied gradient magnetic field and the strength of the residual magnetic field being generated by the applied gradient magnetic field; and
- (3) a step for correcting the calculated residual magnetic field;
- (4) wherein the magnetic resonance imaging method includes a step for updating the residual magnetic field response function used in step (2) by making it depend on the application history of the sequentially applied gradient magnetic field.

[2] A magnetic resonance imaging method according to claim 1, wherein before the steps (1) ~ (4) are performed,

- (5) a step for degaussing the residual magnetic field being

generated in the magnetic device, and for initializing the residual magnetic field response function to the state after degaussing.

[3] A magnetic resonance imaging method according to claim 1 and 2 wherein before steps (1) ~ (5) are performed,

(6) a step for obtaining the residual magnetic field response function after degaussing or after degaussing and applying one or more gradient magnetic field pulses, and for storing it as the calibration data is performed.

[4] A magnetic resonance imaging method according to claim 1 to 3, wherein upon application the correction of the residual magnetic field in step (3) is performed by superposing the correction magnetic field over the gradient magnetic field.

[5] A magnetic resonance imaging method according to claim 4 wherein the superposed and applied correction magnetic field is the gradient magnetic field that has the same axis as the previously mentioned gradient magnetic field.

[6] A magnetic resonance imaging method according to claim 5 wherein the superposed and applied correction magnetic field includes components other than the gradient magnetic field that

has the same axis as the previously mentioned gradient magnetic field.

[7] A magnetic resonance imaging method according to claim 1 to 3 wherein the correction of the residual magnetic field in step (3) is performed by varying the strength of the gradient magnetic field for applying to correct the residual magnetic field of which its strength is previously calculated.

[8] A magnetic resonance imaging method according to claim 1 to 7 wherein the residual magnetic field response function is represented by drawing a residual magnetic field response curve on a two-dimensional chart of which the x-axis indicates the applied gradient magnetic field and the y-axis indicates the residual magnetic field being generated by the application of the gradient magnetic field.

[9] A magnetic resonance imaging method according to claim 1 to 8 wherein the updating of the residual magnetic field response function by step (4) includes:

- (8) a step for varying the value of Y, in the residual magnetic field response curve shown in the above-mentioned chart, so that it becomes the same value as calculated in step (2) in the range between

zero and the strength of the applied gradient magnetic field pulse.

- (9) a step for drawing the residual magnetic field response curve of the above-mentioned chart so that the value of Y is varied from the value calculated in step (2) with a predetermined gradient in the opposite direction of the applied gradient magnetic field pulse being applied from zero by the value X.

[10] A magnetic resonance imaging method according to claim 9 wherein the above-mentioned predetermined gradient is obtained on the basis of the calibration data stored in step (6).

[11] A magnetic resonance imaging apparatus comprising:

a static magnetic field generation means for generating the static magnetic field in the imaging space where the subject is placed;

a gradient magnetic field generation means for applying the gradient magnetic field in the above-mentioned imaging space; and

a control means for controlling the application of the gradient magnetic field by the gradient magnetic field generation means,

wherein the magnetic resonance imaging apparatus comprises

a residual magnetic field correction means being connected to the control means, for correcting the residual magnetic field being generated by the application of the gradient magnetic field taking into consideration the application history of the gradient magnetic field.

[12] A magnetic resonance imaging apparatus according to claim 11 wherein the residual magnetic field correction means comprises:

a residual magnetic field correction control means being connected to the control means, for controlling the correction of the residual magnetic field;

a storage means being connected to the residual magnetic field correction control means, for storing the residual magnetic field response function that depends on the application history of the gradient magnetic field; and

a correction magnetic field generation means being connected to the residual magnetic field correction control means, for applying the correction magnetic field to correct the residual magnetic field according to the residual magnetic field correction controlling signals that are inputted from the residual magnetic field correction control means.

[13] A magnetic resonance imaging apparatus according to claim

12 wherein the residual magnetic field correction control means performs the controlling of the correction for the residual magnetic field by:

- (10) a step for calculating the strength of the residual magnetic field being generated by the application of the gradient magnetic field according to the residual magnetic field response function being stored in the storage means, upon the transmission of the information from the controlling means about the strength of the gradient magnetic field that is to be applied next;
- (11) a step for calculating the strength of the correction magnetic field to correct the residual magnetic field of which its strength is previously calculated;
- (12) a step for transmitting the residual magnetic field correction controlling signals for applying the correction magnetic field of previously calculated strength to the correction magnetic field generation means; and
- (13) a step for calculating and updating the variance of the residual magnetic field response function by the application of the gradient magnetic field, and for storing the updated residual magnetic field response function in the storage means.

[14] A magnetic resonance imaging apparatus according to claim 12 and 13 wherein the correction magnetic field is the gradient magnetic field that has the same axis as the previously mentioned gradient magnetic field.

[15] A magnetic resonance imaging method according to claim 14 wherein the superposed and applied correction magnetic field includes components other than the ones of the gradient magnetic field, that have the same axis as the previously mentioned gradient magnetic field.

[16] A magnetic resonance imaging apparatus according to claim 12 to 15 wherein the correction magnetic field generation means is the correction coils.

[17] A magnetic resonance imaging apparatus according to claim 11 wherein the residual magnetic field correction means comprises:

- a gradient magnetic field correction control means that is connected to the control means, for controlling the application of the gradient magnetic field by correcting the affect of the residual magnetic field; and

- a storage means that is connected to the gradient magnetic

field correction control means, for storing the residual magnetic field response function that depends on the application history of the gradient magnetic field, and the gradient magnetic field generation means is connected to the gradient magnetic field correction control means.

[18] A magnetic resonance imaging apparatus according to claim 17 wherein the gradient magnetic field correction control means controls the correction of the gradient magnetic field by:

- (14) a step for calculating the strength of the residual magnetic field being generated by the application of the gradient magnetic field according to the residual magnetic field response function being stored in the storage means, upon the transmission of the information from the controlling means about the strength of the gradient magnetic field that is to be applied next;
- (15) a step for calculating how much of the gradient magnetic field strength is to be varied for applying to correct the residual magnetic field of the calculated strength;
- (16) a step for transmitting the gradient magnetic field correction controlling signals for applying the gradient magnetic field of the varied strength to the

gradient magnetic field generation means; and

(17) a step for calculating and updating the variance of the gradient magnetic field response function by the application of the gradient magnetic field, and for storing the updated residual magnetic field response function to the storage means.